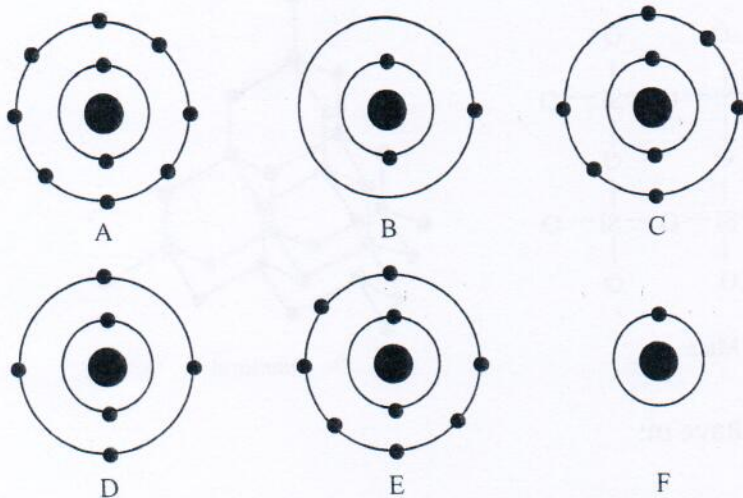


## Grade 9 Chemistry Review

1- The diagrams below represent the electronic arrangement of different atoms and ions.



(a) Which letter represents an atom of a Group I metal?

B ..... [1]

(b) Which letter represents an atom of a Group VII non-metal?

E ..... [1]

(c) Which letter represents an atom of a noble or inert gas?

A ..... [1]

(d) Which letter represents an atom which is not in the second period of the Periodic Table?

F ..... [1]

(e) Which letter represents an ion of a Group I metal?

A ..... [1]

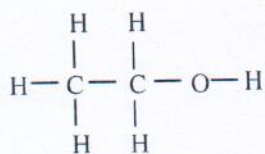
(f) Which two letters represent atoms which form an ionic compound with a formula similar to  $\text{Na}_2\text{S}$ ?

B & C ..... [1]

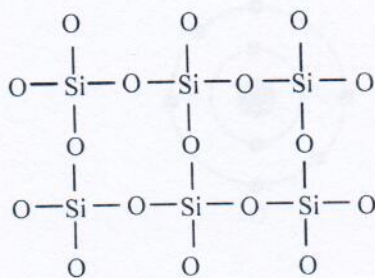
(g) Which two letters represent atoms which form a molecule with a formula similar to  $\text{SiCl}_4$ ?

D & E ..... [1]

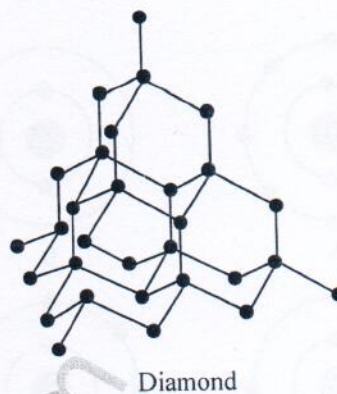
2- The diagrams below show the structures of ethanol, mica and diamond.



Ethanol



Mica



Diamond

(a) How many bonds does each carbon have in:

(i) ethanol? 4 ..... [1]

(ii) diamond? 4 ..... [1]

(b) How many bonds does each hydrogen have in ethanol? 1 ..... [1]

(c) (i) How many bonds does each silicon have in mica? 4 ..... [1]

(ii) How many bonds does each oxygen have in mica? 2 ..... [1]

(d) (i) Which of the elements, carbon, hydrogen, oxygen and silicon would you expect to find in the same group of the Period Table?

C & Si ..... [1]

(ii) Explain your answer.

each have 4 bonds. .....

..... [2]



3- Sodium chloride is often called common salt.

It can be made by reacting a small piece of hot sodium with chlorine gas.

(a) Write the electronic arrangement for an atom of:

(i) sodium ..... 2, 8, 1 ..... [1]

(ii) chlorine ..... 2, 8, 7 ..... [1]

(b) Write down the formulae of the ions formed by:

(i) sodium ..... 2, 8 ..... [1]

(ii) chlorine ..... 2, 8, 8 ..... [1]

(c) Write down the formula of sodium chloride. .... NaCl ..... [1]

(d) Solid sodium chloride will not conduct electricity, but when dissolved in water it will.

(i) Explain why an aqueous solution of sodium chloride conducts electricity.

..... ions are free ..... [1]

(ii) In what other way could you alter the state of sodium chloride so that it will conduct electricity?

..... molten ..... [1]

(e) A hot piece of sodium was placed in a jar of helium. No reaction took place.

(i) Write the name of the group of the periodic table to which helium belongs.

..... ~~2~~ Noble gases ..... [1]

(ii) Explain why helium is unreactive.

..... full outer shell ..... [1]

4- The following table shows some of the ions found in natural waters.

ion	$\text{Mg}^{2+}$	$\text{Na}^+$	$\text{SO}_4^{2-}$	$\text{NO}_3^-$	$\text{Ca}^{2+}$	$\text{Cl}^-$	$\text{K}^+$
name	magnesium	sodium	sulphate	nitrate	calcium	chloride	potassium

(a) Use the list of ions to work out the formulae of the following compounds: (Explain your answers)

(i) sodium sulphate

$\text{Na}_2\text{SO}_4$  ..... [2]

(ii) potassium nitrate

$\text{KNO}_3$  ..... [2]

(iii) calcium chloride

$\text{CaCl}_2$  ..... [2]

(iv) magnesium nitrate

$\text{Mg}(\text{NO}_3)_2$  ..... [2]

(v) potassium chloride

$\text{KCl}$  ..... [2]

(b) (i) What type of bonding occurs in all of these compounds?

ionic ..... [1]

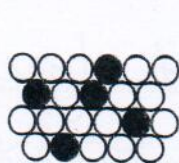
(ii) Explain how this type of bonding occurs.

attraction between a cation (lost  $e^-$  to be full) & an anion (gained an  $e^-$  to be full) ..... [2]

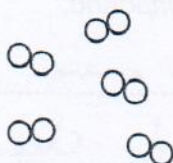


5-

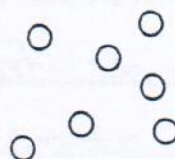
The diagram shows models of various structures,



A



B



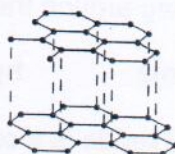
C



D



E



F

- (a) Which **three** of the structures **A** to **F** represent elements? Give a reason for your answer.

structures B, C, F

reason made from same type of atom [2]

- (b) Which one of the structures **A** to **F** represents a gas containing single atoms?

C

[1]

- (c) (i) Which one of the structures **A** to **F** represents a gas containing diatomic molecules?

B

- (ii) State the name of a gas which has diatomic molecules.

Cl<sub>2</sub> / F<sub>2</sub> / H<sub>2</sub> / N<sub>2</sub> / O<sub>2</sub> [2]

- (d) (i) Which one of the structures **A** to **F** represents graphite?

F

- (ii) State **one** use of graphite.

lubricant / pencils [2]

6-

(e) Structure D represents a compound.

(i) State what is meant by the term *compound*.

.....made from 2 or more different types  
.....of atoms bonded chemically together.....

(ii) Which one of the following substances is structure E most likely to represent?

Put a ring around the correct answer.

ammonia

hydrogen chloride

methane

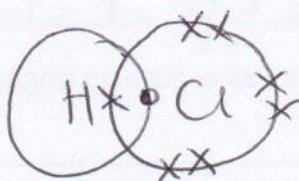
water

[2]

(f) Hydrogen chloride is a compound.

(i) Draw a diagram to show how the electrons are arranged in a molecule of hydrogen chloride.

Show only the outer electrons.



show hydrogen electrons as •  
show chlorine electrons as x

[2]

(ii) State the name of the type of bonding present in hydrogen chloride.

covalent

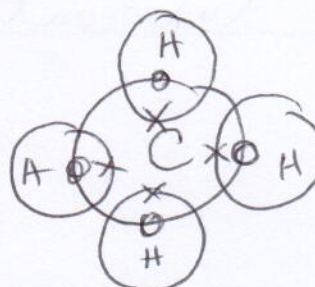
[1]

7-

Draw a diagram to show the arrangement of the electrons in a molecule of methane,  $\text{CH}_4$ .

Use

- for an electron from a carbon atom
- x for an electron from a hydrogen atom





(b) Some uses of some non-metallic elements are shown below.

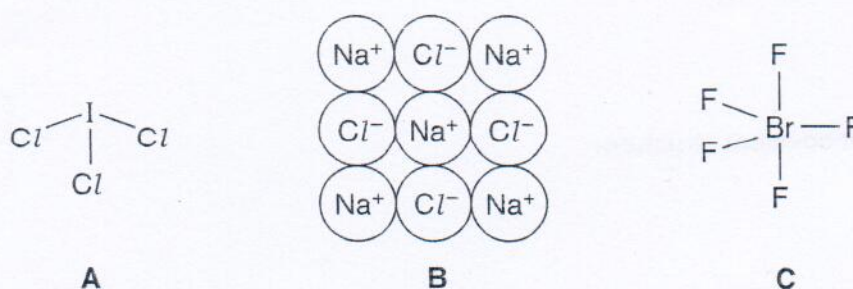
Draw lines between the boxes to link the elements to their correct uses.

The first one has been done for you.

element	use
oxygen	in light bulbs
argon	in oxygen tents in hospitals
chlorine	to kill bacteria in water purification
carbon (graphite)	in balloons
helium	as a lubricant

[4]

(c) The structures of some halogen compounds are shown below.



(i) Describe the type of bonding in compound **A**.

..... covalent .....

(ii) State the simplest formula for compound **C**.

..... BrF<sub>5</sub> .....

(iii) Explain why compound **B** does not conduct electricity when solid but does conduct when molten.

..... solid: ions not free .....

..... molten: ions free to move therefore conducts .....

[4]

8-

The diagram shows part of the Periodic Table.

I	II											III	IV	V	VI	VII	0
Li													C	N	O	F	He
Na															S	Cl	Ne
K							Fe			Cu	Zn					Br	Ar
																Kr	

(a) Answer these questions using **only** the elements shown in the diagram.

Write down the symbol for an element which

(i) is a transition metal.

Fe, Cu, Zn

(ii) forms an acidic oxide.

N, S, Br, F, Cl

(iii) has six electrons in its outer shell.

O, S

(iv) has a giant covalent structure.

C

(v) reacts rapidly with water.

Li, Na, K

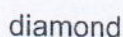
(vi) has a higher proton (atomic) number than iron.

Cu, Zn, Br, Kr

[6]



The structures of diamond and chlorine are shown below.



● = carbon atom



○ = chlorine atom

- (a) Describe the structure of these two substances. Use the list of words to help you.

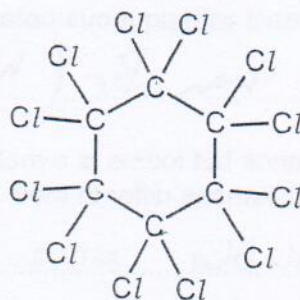
covalent      diatomic      giant      macromolecule      molecule      structure

diamond giant covalent structure  
macromolecules

chlorine diatomic molecules.  
simple covalent bonding between identical atoms.

[4]

- (b) The structure of a compound containing carbon and chlorine is shown below.



What is the molecular formula of this compound?

 $C_6A_{12}$ 

[1]

10-

The diagram shows part of the Periodic Table.  
Only some of the elements are shown.

Li				
Na	Mg			
K	Ca		Ti	V
			Zr	Nb

(a) Answer the following questions by choosing only from the elements shown in the diagram.

You can use each element once, more than once or not at all.

(i) State the names of **two** transition elements shown in the diagram.

Ti / V and Zr / Nb [2]

(ii) State the name of an element which is in Period 3 of the Periodic Table.

Na, Mg [1]

(iii) Which element has the electronic structure 2,8,1?

Na [1]

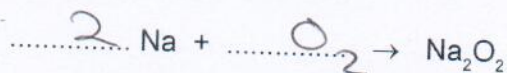
(iv) Which element has the fastest reaction with water?

K [1]

(v) Which element has 23 protons in its nucleus?

V [1]

(b) Sodium reacts with oxygen to form sodium peroxide,  $\text{Na}_2\text{O}_2$ .  
Complete the symbol equation for this reaction.



[2]



(c) Chlorine is a halogen.

(i) State the colour of chlorine.

yellow-green [1]

The table shows some properties of the halogens.

element	boiling point/°C	density in liquid state/g per cm <sup>3</sup>	colour
fluorine	-188	1.51	yellow
chlorine	-35	1.56	
bromine	-7		red-brown
iodine	+114	4.93	grey-black

Use the information in the table to answer the following questions.

(ii) Predict the density of liquid bromine.

1.57 → 4.92 (any number in between) [1]

(iii) Describe the trend in boiling point of the halogens down the group.

bp increases. [1]

(d) (i) Complete the word equation for the reaction of bromine with aqueous potassium iodide.

bromine + potassium iodide → potassium + iodine  
bromide

[2]

(ii) Explain why bromine does **not** react with aqueous potassium chloride.

Cl more reactive than Br (higher) [1]

(e) Potassium chloride is an ionic substance but iodine is a molecular substance. How do most ionic and molecular substances differ in their

solubility in water, ionic soluble since they have charges  
that will attract the water / I<sub>2</sub> not soluble

electrical conductivity? ionic conductive if molten or  
dissolved in water since you free the ions [2]

& I<sub>2</sub> not conductive.

11-

Fluorine, chlorine, bromine and iodine are elements in Group VII of the Periodic Table. Scientists are trying to synthesise a new element in Group VII with a proton number of 117.

- (a) How many valency electrons will be present in one atom of this new element?

.....7.....[1]

- (b) Complete the following table about an isotope of this new element.

nucleon number	280
number of protons	117
number of neutrons	163

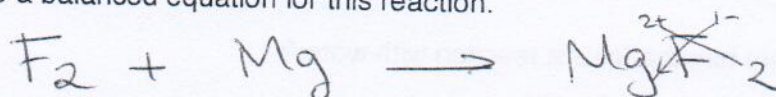
[2]

- (c) Predict **two** physical properties of this new element.

1 .....black.....  
 2 .....higher melting point / higher boiling point / high density.....[2]

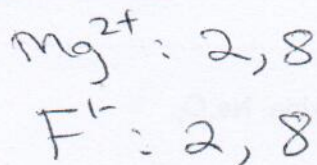
- (d) Fluorine reacts with magnesium to form magnesium fluoride.

- (i) Write a balanced equation for this reaction.



[1]

- (ii) Give both the electronic configuration and the charge on the ions which are present in magnesium fluoride.



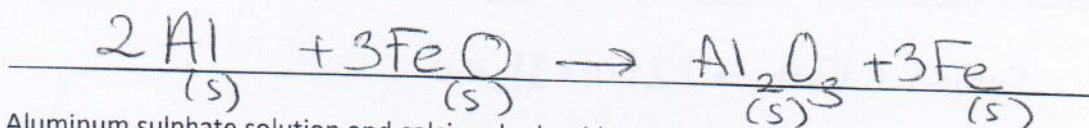
[2]



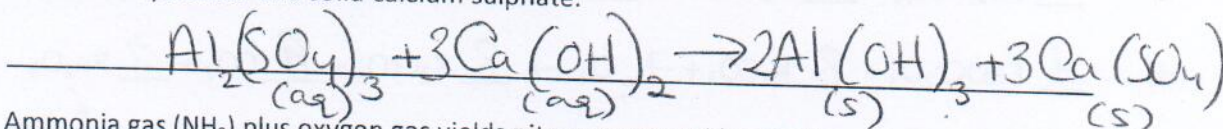
12-

Write the chemical equations and balance each of the following word equations.

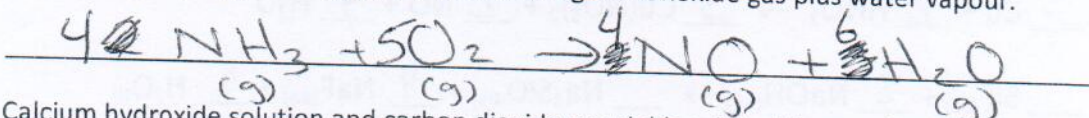
- a) Aluminum metal reacts with iron (II) oxide powder to produce aluminum oxide solid and iron metal.



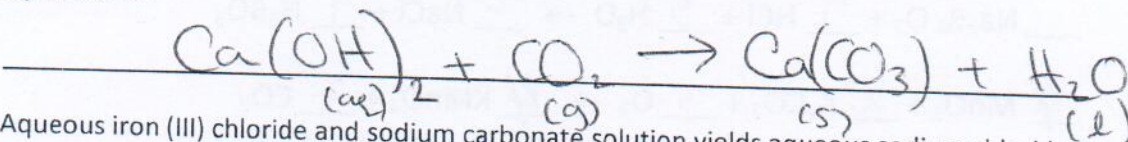
- b) Aluminum sulphate solution and calcium hydroxide solution produce a precipitate of aluminum hydroxide and solid calcium sulphate.



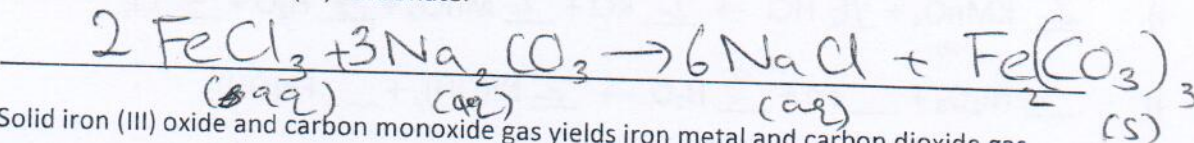
- c) Ammonia gas (NH<sub>3</sub>) plus oxygen gas yields nitrogen monoxide gas plus water vapour.



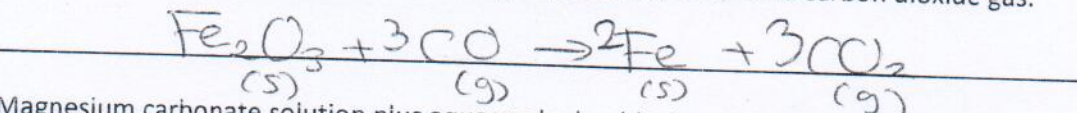
- d) Calcium hydroxide solution and carbon dioxide gas yields solid calcium carbonate and liquid water.



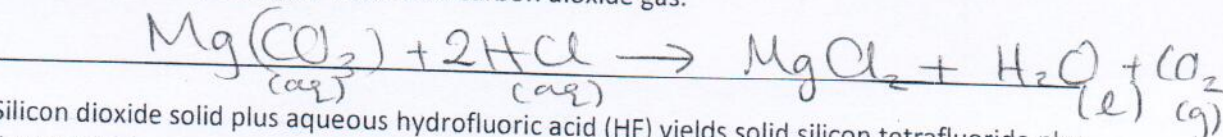
- e) Aqueous iron (III) chloride and sodium carbonate solution yields aqueous sodium chloride and a precipitate of iron (III) carbonate.



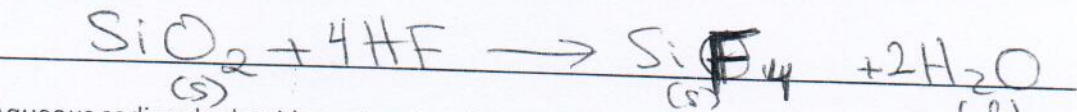
- f) Solid iron (III) oxide and carbon monoxide gas yields iron metal and carbon dioxide gas.



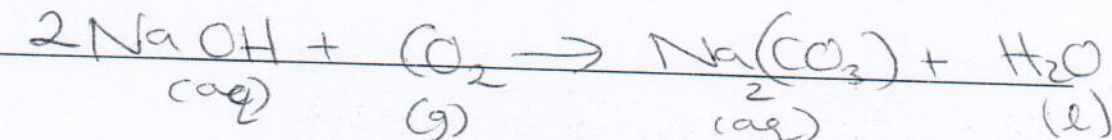
- g) Magnesium carbonate solution plus aqueous hydrochloric acid (HCl) yields magnesium chloride solution plus liquid water and carbon dioxide gas.



- h) Silicon dioxide solid plus aqueous hydrofluoric acid (HF) yields solid silicon tetrafluoride plus liquid water.



- i) Aqueous sodium hydroxide and carbon dioxide gas yields sodium carbonate solution and liquid water.



13-

Balance the following chemical equations.

